Canada

Discussion Paper

COSTING OF SELECTED LABOUR STANDARDS: AN EXPLORATORY STUDY

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AN EXPLORATORY STUDY

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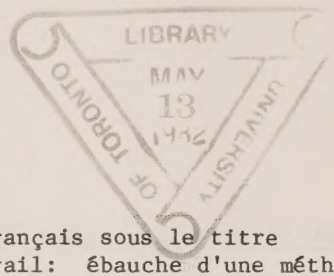

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PREFACE

Labour standards legislation and regulations have been enacted or promulgated over the years to provide acceptable employment conditions and a safer environment at the workplace. These standards embrace wages, hours of work, holidays, basic human rights, such as freedom of association, and concerns over the health and safety of workers. Given the need for preventive and protective measures, the benefits arising from new or improved regulations are usually implicit, particularly when the health of workers is endangered. In fact, there are formidable problems of a conceptual and empirical nature in measuring benefits, as the regulations are typically expressed in qualitative terms.

In addition to the benefits, such labour standards also impose costs. It is the purpose of this discussion paper to shed some light on this issue, exploring the methodological problems of estimating costs associated with labour standards.

The paper is divided into two parts which approach the issue from two quite distinct perspectives. In Part I, a selected set of labour standards are costed, with emphasis where possible on the Canadian experience. Part II introduces an international aspect to the discussion, whereby some trade effects of international labour legislation are traced.

The study reveals two particular items of note. First, there does exist a set of labour standards which can be effective at a relatively low cost. Second, there is a paucity of data to support cost analyses of most labour standards. Nevertheless, the paper makes a useful contribution to the improvement of the analysis of this important issue.

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INTRODUCTION

There is an ongoing concern in our society about the quality of life in the workplace. This is frequently made evident at the bargaining table and as an example, unsafe working conditions, can be the cause of work stoppages. The Canadian entrepreneur now faces a wide range of government regulation in this area, from minimum wage laws to restrictions on industrial noise levels.

Rarely are regulations of this type (henceforth labelled "labour standards") without cost. Employers typically incur increased costs, specifically factor or production costs, to attain and maintain a new standard. Oddly enough however, there is relatively little known about the nature and magnitude of these incremental expenditures. That costs of this nature can be accurately calculated is certainly not a moot point either. It is on these issues that this paper will focus.

The paper has two main sections. Part I provides an analysis of nine labour standards. The methodology of cost determination is emphasized and empirical support, based on North American and where possible Canadian data, is provided. The textile industry is singled out for study, because data on it is relatively plentiful and it is a useful example of one which must face a wide range of labour standards issues.

The empirical work of Part II is also based primarily on textile industry data. In this section a discussion of the broader economic issues is presented with particular reference to international

labour standards. This is included to place the results obtained in Part I into context. An economic impact model based on simple international trade assumptions is also presented. Conclusions are drawn in the final section of the paper.

PART I - COST OF STANDARDS

Labour standards can reasonably be broken down into three groups: individual (or human) rights, labour compensation (direct and indirect), and occupational safety and health (OSH). Taken together, these describe the individual's work environment. In this section, each group is investigated separately and where possible, specific labour standards are chosen for analysis. Those selected are relevant, reflect variety and can be easily quantified. Occupational safety and health standards meet these criteria and so emphasis will be placed on them. Table 1 provides a list of labour standards which will be considered.

Table 1

Labour Standards Selected for Costing Study

Labour Compensation

1. reduced length of work week

Occupational Safety and Health

A. Basic Standards

soft technologies:

2. medical skill availability
3. medical equipment availability
4. education about safety and workplace hazards
5. on-the-job training
6. availability of personnel protective devices (PPD's)
7. machinery maintenance and upkeep

B. Sophisticated Standards

8. limitation of noise level exposure
9. cotton dust control (textile industry)

INDIVIDUAL RIGHTS

The type of standards that fall into this category include the freedom of association, the right to organize, the right to collective bargaining, the abolition of forced labour, the freedom from discrimination, and equal pay for work of equal value. Many of these have been encoded in national legislation or in International Labour Organization (ILO) conventions and recommendations. It is anticipated that some of these standards, such as freedom from discrimination, would be significantly less costly than others as they would not impact on production processes.

The quantification of human rights issues is not without controversy. It has been argued that the principles involved are sufficiently important to make the costs irrelevant. Nevertheless the issues warrant at least a brief overview.

As a case in point, consider the right to organize. It is well documented that unionization has a positive impact on wage rates, working conditions, and labour compensation generally. However, the analytical work has specifically been concentrated on the effects of unionization on relative wages.[1] The work of Lewis (1963), Kahn (1979) and Maki and Christensen (1980) is notable in this regard. In general terms, they present single (or simultaneous) equation models which include the degree of unionization as one of several dependent variables explaining relative wage levels. The ultimate result is an estimate of the degree to which relative wages are higher (or lower) as a consequence of unionization, ceteris paribus.

This exercise has not been done for the Canadian textile industry. However, a summary of the results of Kahn (1979) for U.S. manufacturing and Maki and Christensen (1980) for Canadian manufacturing is offered. The important results in the Kahn study for the present purpose are in row 1 of Table 2. A one per cent increase in unionism will lead to a 1.22 per cent increase in the relative wage of unionized workers. It is estimated that a 0.55 per cent increase will take place in the short run and the remainder (0.67 per cent) after subsequent changes have occurred in the production function.

Table 2

Effects of an Exogenous One Percentage Point Increase in Unionism

Endogenous Variable	Direct Effect	Indirect Effect	Total Effect
ln W	0.0055*	0.0067	0.0122*
ED	-	0.0090	0.0090
SK	0.2850	0.6270	0.9120*
UN	1.00*	1.086*	2.086*

*significant at 0.05 level.
W = average hourly wage (production workers).
ED = level of education.
SK = % of skilled workers.
UN = % of production workers in unionized shops.
Source: Kahn, L.M. Unionism and Relative Wages: Direct and Indirect Effects. Industrial and Labor Relations Review, July 1979, pp. 527, 528.

The reader should also note that these results cannot be applied to industries where unionism is initially very low or nil. Indeed the sample of industries used by Kahn had levels of unionism varying from 24 to 99 per cent. Kahn also notes that the impact of unionism on industries where unions are not prevalent is likely to be lower than indicated in Table 2 (Kahn, p. 529), however data supporting this claim is evidently rare.

The second pertinent study is Maki and Christensen (1980). They apply Canadian data to a simultaneous equations model in order to estimate the effect of unionism on nominal wage rates. Their results provide some support of the Kahn analysis. In particular, they found a union/non-union wage differential of 51 per cent, though it is noted that due to the limited range of union coverage observations in the industries studied, little confidence is maintained by the authors in this result.

The foregoing discussion is a simplification of a relatively complex econometric estimation procedure. Nevertheless, it illustrates the point that the acknowledgement of human rights, in this case, unionism, can have a significant cost impact.

LABOUR COMPENSATION

It is somewhat unorthodox to analyze the compensation package in terms of labour standards. Most often it is examined within the context of an economic model of the labour market. However it is useful to break from tradition in this case to provide insights into remuneration patterns. Consider Tables 3 and 4. They display the breakdown of labour compensation into its components. The textile data is of primary

interest, but five other industries (knitting mills, clothing, leather products, furniture/fixtures, and electrical production) are included for contrast.

Direct compensation (pay for time worked) in the textile industry is 82.2 per cent of total compensation or an average of $8 605 per employee (1976$). Tables 3 and 4 also show that indirect compensation (official holidays, vacations, sick leave, bonuses, severance pay, employer contributions to benefit/welfare plans) is significant. Specifically, paid absence (particularly holiday and vacation pay) and contributions to pension plans, unemployment insurance, and workers compensation form the largest segment of non-wage costs to employers. Finally, as Table 4 shows, the textile industry is not atypical of the other so-called vulnerable industries in Canada in terms of the relative importance of each segment of compensation.

The transformation of the data into statements about the costs of labour standards of this class can be done from two perspectives, the short and the long-term. The distinction between the two is simply that in the short-term all economic variables are held constant at a point in time. In this case the costs of a standard can be inferred from data in Table 3 by relatively simple calculations, as illustrated below.

Table 3

Average Labour Compensation - Canadian 'Vulnerable' Industries - 1976[1]
($/Employee)

	Textiles	Knitting Mills	Clothing	Leather Prods.	Furniture/ Fixtures	Elec. Prods.
Regular Work	7 633	7 431	6 911	7 169	8 891	10 329
Overtime	428	219	117	96	159	650
Shift Premium	89	28	-	7	6	68
Commissions & Incentives	432	146	223	549	445	114
Other	23	2	1	1	2	8
PAY FOR TIME WORKED	8 605	7 826	7 252	7 822	9 503	11 169
Holidays Paid	352	284	283	293	389	510
Paid Vacation	499	374	375	396	480	686
Sick Leave	45	22	7	17	27	84
Other Absence	18	6	5	5	6	13
PAID ABSENCE	914	686	670	711	902	1 293
Bonuses	18	67	18	107	73	30
Severance Pay	31	31	9	13	11	20
Taxable Benefits	105	48	29	62	106	166
Other	77	-	1	3	-	3
OTHER DIRECT PAY-MENTS TO EMPLOYEES	231	146	57	185	190	219
GROSS PAYROLL	9 750	8 658	7 980	8 717	10 595	12 680
EMPLOYER CONTRIBUTIONS TO BENEFIT PLANS	721	567	415	464	795	1 302
TOTAL COMPENSATION	10 471	9 225	8 395	9 181	11 390	13 982

[1]Source: Statistics Canada catalogue no. 72-618

Table 4

Average Labour Compensation - Canadian 'Vulnerable' Industries - 1976[1]
(% of pay for time worked)

	Textiles	Knitting Mills	Clothing	Leather Prods.	Furniture/ Fixtures	Elec. Prods.
PAY FOR TIME WORKED	100	100	100	100	100	100
PAID ABSENCE						
Holidays Paid	4.1	3.6	3.9	3.7	4.1	4.6
Vacation Paid	5.8	4.8	5.2	5.1	5.1	6.1
Sick Pay etc.	0.7	0.4	0.2	0.3	0.4	0.9
OTHER DIRECT PAYMENT TO EMPLOLYEES						
Bonuses	0.2	0.9	0.2	1.4	0.8	0.3
Severance Pay	0.4	0.4	0.1	0.2	0.1	0.2
Taxable Benefits	1.2	0.6	0.4	0.8	1.1	1.5
Other	0.9	-	-	-	-	-
Gross Payroll	113.3	110.6	110.0	111.4	111.5	113.5
EMPLOYER CONTRIBUTIONS TO WELFARE/BENEFIT PLANS						
W.C.	2.1	1.2	0.7	1.0	2.3	1.6
U.I.	1.8	1.7	1.7	1.7	1.7	1.6
CPP/QPP	1.5	1.5	1.6	1.5	1.3	1.2
Private Pensions	1.5	1.2	0.3	0.5	0.5	5.0
OHIP	0.5	0.6	0.7	0.4	0.4	0.5
Life/Health Insurance	0.8	1.0	0.4	0.8	1.0	1.6
Other	0.2	0.1	0.3	0.1	-	0.1
TOTAL COMPENSATION	121.7	117.9	115.8	117.4	118.8	125.2

[1]Source: Statistics Canada catalogue no. 72-618

STANDARD 1: A MAXIMUM WORK WEEK OF 35 HOURS

Assumptions:
(1) The work week is reduced to 35 from 40 hours.
(2) The firms' production function and output are unchanged.
(3) Wages are downwardly rigid.
(4) Labour supply is sufficient to meet increased demand.

The consequence of these assumptions is that firms must increase their employment by 12.5 per cent to maintain existing production levels, and by so doing, increase the wage bill by the same percentage. This implies that in the short-term, expenditures on pay for time worked would increase, on average, by 0.125 ($8 605) = $1 076 per employee in the Canadian textile industry.

Note the role of assumptions (1) through (3) in the example, which restrict the impact of the standard and allow the costs to be calculated directly. This does not apply when more realistic assumptions are used which allow for long-term considerations. A complete (perhaps general equilibrium) model is necessary to trace these subsequent effects. Such increases in labour costs are likely to induce a reallocation of resources away from labour intensive production processes. Indeed, when considering factor intensities and elasticities of substitution between factors, the ultimate employment effect of the standard could be the opposite of the original intent.

OCCUPATIONAL SAFETY AND HEALTH

The third class of labour standards to be discussed pertain to health and safety in the workplace. In the 1980's the employer rarely has sole control over the conditions in his work area, but must provide the safe environment for his employees that is mandated by the society.

Of prime concern in the context of this paper are the costs to the employer of providing this acceptable work environment. In this section the task is approached by focussing on a chosen set of pertinent safety and health standards. These standards were selected to represent the range and diversity (in terms of cost and design) of potential health and safety programs. The reader will then be able to more fully understand not only the types of expenditures that must be faced, but more importantly the factors that must be considered in determining the costs.

Discussion of the standards will proceed on the basis of their classification as outlined in Table 1. In that table eight specific standards are identified and are classified as either "basic" or "sophisticated." A "basic" standard is one which requires relatively little technological innovation and can be attained without recourse to major changes in the production process. "Sophisticated" standards may require marked changes in plant operation to be attained. This seemingly arbitrary distinction will be seen to reflect a fundamental difference in the implications for employers of the two types of labour standards. To begin, "soft technologies" - those standards which are not capital intensive in nature - will be discussed.

STANDARD 2: SOFT TECHNOLOGIES - AVAILABILITY OF MEDICAL SKILLS

Using the Canada Labour Code* as a guide, it is assumed that in every plant which employs between 15 and 200 people there must be an employee trained in first-aid available on every shift. In plants with over 200 employees, a first-aid attendant must be present on every shift. Three separate cases should be considered.

Plants with less than 15 employees would be unaffected. In 1976, there were over 330 such operations in the Canadian textile industry.

Plants which employ between 15 and 200 employees must provide first-aid training to at least as many employees as there are shifts. Assume an average of two shifts (s) for present purposes. Training costs (t) here are estimated according to the tuition fees per course in technical colleges and range from $20 to $85 per person. Assuming there is no productivity decrease during training, total costs per plant (C) are simply:

$$C = st \qquad (1)$$

Thus, (C) ranges from $40 to $170 depending on the value of (t). If the average employment per plant is taken to be 108, $0.36 to $1.54 per employee would be required to ensure that medical skills were available at the plant. These figures would be slightly higher if staff turnover were taken into account.

For plants larger than 200 employees, modification of (1) can be employed to determine the costs of the regulation.

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*The Canada Labour Code does not apply to the textile industry but the standards described therein may be used in the present discussion.

$$C = sw \qquad (1')$$

(s) is defined as above (i.e., s = 2) and (w) represents a first-aid attendant's salary which is approximately that of a general duty registered nurse or $11 000 to $15 000 per annum (1976). The estimated annual cost to the plant is therefore from $22 000 to $30 000. That is, $55 to $75 per employee annually assuming that on average a plant employs 400 people.

The conclusion here is that the cost of medical services as defined, can be considered low and will range from $0.36 to $75 per employee annually based on plant size data in Table 5. It should also be emphasized that plant size and prevailing wage rates are key explanatory variables in evaluating the costs of this standard.

Table 5

Size of Establishments - Vulnerable Industries - 1975

No. of Employees	Leather	Textiles	Knitting Mills	Clothing
1-4	63	173	49	566
5-9	47	159		
10-19	52		40	946
		332		
20-49			80	
50-99		94	58	303
100-199	250	74	53	
				271
200-499		67	23	
500-999	3	17	3	8
1 000		7		
Total Firms[1]	415	923	306	2 094
Total Employment[1]	26 411	68 209	24 332	100 528
Av. Firm Size	64	74	80	48

[1]Excludes head offices in leather, textile and knitting mill manufacturing industries.
Source: Statistics Canada Catalogue no. 31 210

STANDARD 3: SOFT TECHNOLOGIES - AVAILABILITY OF MEDICAL EQUIPMENT

The Canada Labour Code currently requires a "first-aid kit" on the premises for plants with less than 200 employees and for larger ones there must be a "first-aid room". Cost estimates of providing a first-aid kit are done in this section, but due to a lack of data the second aspect of the standard is omitted.

To derive an estimate of the cost to meet this standard, formula (2) is employed. (C) is cost per employee, (P) is the cost per unit, (n_i) is the number of units required for plant size (i), (s) is the number of plants of size (i), and (E) is industry-wide employment. To illustrate, let the subscript (i) represents operations with average employment levels of 800, 400, 200, and 100 or less. Thus:

$$C = P\left[\sum_i n_i s_i\right]/E \qquad (2)$$

Using Canadian textile industry data (in particular that in Table 5) to solve (2), costs could range from $0.80 per employee to $4.00 per employee.[2] Maintenance costs would be negligible relative to initial acquisition expenditures in this case.

Corroboration exists for the cost estimates of medical skill and equipment derived above. "In 1974, Western Electric spent...about $60 per employee for strictly medical services".[3] Also, the Conference Board[4] surveyed "...828 companies employing more than 500 people" and found that expenditures for medical services varied rather widely, as illustrated in Table 6. They suggested furthermore, that the cost of medical services varies inversely with plant size. For smaller plants then, the per employee cost of medical services could be well over $35.

The reader is cautioned that these figures are not strictly comparable to the ones derived above. Nonetheless, the costs for medical services which are reported in other sources are of the same order of magnitude as those calculated here.

Table 6

Expenditures on Medical Services

% of Companies	$/Employee (1971)
	$
17	35
8	26-35
13	16-25
27	5-15
22	0-5
11	0

Source: Conference Board Industry Roles in Health Care New York, 1974 p. 21

STANDARD 4: SOFT TECHNOLOGIES - SAFETY EDUCATION

The annual costs of providing safety education can be attributed to three sources: fixed costs, costs of instruction, and the costs of lost production (opportunity costs). Assuming that every new employee must attend a safety course of a prescribed length, that signs must be posted warning of plant dangers and providing safety tips, and that the value of an employee's production loss is represented by his wage, then algebraically,

$$C = s + (tn)/E + rwh \qquad (3)$$

where (C) is annual per employee costs, (s) is annual fixed costs (costs of signs), (tn) is the wage bill for instructors, (E) is industry-wide employment, (w) is the average hourly wage for the industry (in this case textiles), (h) is the number of hours of annual instruction time,

and (r) is the annual staff turnover rate. Assigning reasonable values to these variables[5], one arrives at the relatively low annual per employee cost of $15.64.

This estimate is based on several assumptions. However, evidence exists that education costs tend to be a very small part of a firm's safety budget. For example, in one U.S. chemical plant training costs were $10 000, or 1/44 of the incremental costs of the Occupational Safety and Health Act (OSHA) to the plant.[6]

STANDARD 5: SOFT TECHNOLOGIES - ON-THE-JOB TRAINING

A requirement that only trained workers operate plant equipment can be evaluated with a modified form of equation (3). By definition, there are no expenditures on course instruction and it is postulated that fixed costs would be negligible (administrative costs primarily). There would be productivity loss during training, for both the "trainee" and his supervisor, as measured by the productivity factor (k). Thus where (r) and (h) and (C) are defined as above,

$$C = r\,(wa + w_b)\;k \qquad (3')$$

$$= r2wh\;k \qquad (3'')$$

(wa) and (w_b) are the wages of the "trainee" and "trainer" ($wa + w_b$) and by assumption, $wa + w_b = 2w$, where (w), is the average hourly wage for the industry ($4.50/hour in 1976). (k) ranges from 0 to 1 and approaches 1 as the productivity loss grows. One can evaluate (3") given values for (r), (h), (k) and (w). An estimate of the annual costs could be $73 per employee.[7]

The estimate of $73 is high because it implies that workers involved in a training session are totally unproductive. If they were fully productive (k=0), the costs of the program would be negligible.

A reasonable mean for the textile industry may be $25 per employee, i.e., a 33 per cent productivity loss during training or (k) = 0.33. This cost estimate is a function of wage rates so it will vary across jurisdictions.

A paper by F.C. Rinefort in Professional Safety, Sept. 1977, complements this discussion of soft technologies in labour standards. He examined the safety activities (including training, safety rules and orientation, safety meetings and medical practices), attitudes, and expenditures in three Texas industries in 1974. One hundred and forty chemical, paper, and wood products manufacturers were surveyed. Firms were classified by size and by the frequency of injury-causing accidents. The results pertaining to the costs of safety activities are presented in Table 7.

Table 7

Per Employee Costs of Safety Activities - Texas - 1974

Plant Size	Chemicals		Paper Products		Wood Products	
	L $	H $	L $	H $	L $	H $
Small	414	645	280	346	151	285
Medium	493	624	187	156	111	221
Large	757	720	203	525	145	222
% of Annual Average Wages	6.1%		3.3%		3.1%	

L = low injury frequency rate
H = high injury frequency rate
Source: Rinefort, F.C. A New Look at Occupational Safety. Professional Safety. Sept. 1977, pp. 9-10.

Two points should be made. If the costs derived in this portion of the paper are summed (see Part (2) of Table 14), the resulting per employee expenditure on soft technology standards (which ranges up to over $170) compares favourably with the estimations of Professor Rinefort. The second point is equally important. To quote Rinefort, "In seven of the nine groupings of firms by size and industry, those firms with lower work injury frequency rates spent less on the average than those similarly classified firms which had poorer safety records. One possible explanation of this is that good safety performance is more dependent upon the correct mix of safety activities and upon the quality of such activities than upon the total amount of money spent."[8] Interpretation of cost calculations of these labour standards should be done with this in mind.

STANDARD 6: AVAILABILITY OF PERSONAL PROTECTIVE DEVICES (PPD's)

Insufficient data did not allow a cost analysis of this item in this paper. However other findings can be reported. At Burlington Industries, a large American textile manufacturer, the "...initial costs of their audiometric program, which included the purchase of testing equipment and personal protective devices, ranged from $16.20 to $20 (1973 dollars) per employee."[9] Also, it costs "...approximately $5 per pair...for individually molded ear plugs"[10], and it is suggested that the costs of PPD's are "...low in comparison to the potential costs of engineering controls."[11] This is particularly relevant to the textile industry where the noise problem is especially serious. As further evidence, " ...safety glasses, protective clothing, hard hats, safety belts, respirators, and other safety appliances cost Bethlehem Steel

Company $5 million in 1974."[12] Bethlehem Steel employs several thousand production workers. Thus, on the basis of available evidence, it is estimated that protective equipment would cost the average sized textile firm approximately $35 per employee (1980$).

In general, companies argue for the low cost and effectiveness of PPD's; Continental Can Company has done so in the U.S. courts. However, both American and Canadian labour regulations regard PPD's as a temporary measure and state that where feasible, other alternatives in ensuring safety and protection must be developed and implemented. This puts even the most favourable cost estimates in a somewhat different light.

STANDARD 7: MACHINERY/EQUIPMENT MAINTENANCE

As Table 8 indicates the Canadian textile industry spent $53.4 million on machinery and equipment repairs in 1976 which slightly exceeds the 1974-78 annual average of $50.1 million. Now, it is reasonable to assume that the bulk of this expenditure was made to improve productivity and hence profitability, but some percentage was due to a need for upgrading of safety features to accepted levels. The question is how much?

In the mid-1970's the total capital spending for the U.S. textile companies was $53.4 million. Of this amount it is estimated that 4.9 per cent was devoted annually to safety and health and plans were being made to allocate up to 8 per cent. This suggests a reasonable range of expenditures on machinery and equipment repairs

which could be ascribed to safety and health factors. This translates into per employee costs of from $38.36 to $62.63.[13]

Care must be taken in interpreting these figures. They state that, based on 1976 statistics, it may cost between $38.36 and $62.63 per employee annually to ensure a level of machinery maintenance sufficient to meet North American safety and health standards. That is an approximation of the desired but unavailable information - the costs of maintaining the safety features of machinery, and capital equipment.

Some general issues regarding costs are noteworthy at this point. Table 8 presents a cross-sectional picture of the capital costs of textile and comparable industries in Canada, circa 1976. It is evident from the table that the textile industry is relatively capital intensive and not averse to expenditures on plant and equipment. The degree of capitalization in textiles is 60 per cent greater than that of clothing, an industry to which it is often compared.

It is also apparent from Table 8, that the more capital intensive an industry is, the more it will spend on maintenance of its machines, including the safety features. This can be explained in part by the fact that capital intensive industries are least able to afford absenteeism and down-time due, for example, to occupational injuries (i.e., the marginal product of each worker is higher).

Table 8

Capital Costs - Vulnerable Industries - 1976

		Textiles	Knitting Mills	Clothing	Leather Products
1.	($ Millions)				
	Value Added	1 206.4	302.1	1 312.4	363.4
	Labour Compensation	714.3	217.0	853.9	242.9
	Inferred capital costs[1]	492.1	85.1	458.5	120.5
2.	Capitalization ($)[2]	7 215	3 619	4 507	4 553
3.	Capital Intensity[3]	41%	28%	35%	33%
4.	Actual capital Expenditures ($Millions)				
	(a) Construction	19.1	1.5	3.7	3.4
	(b) Machinery and Eqpt.	91.0	7.7	18.1	8.1
5.	Repair Expenditures ($Millions)				
	(a) Construction	9.1	0.9	2.1	2.2
	(b) Machinery and Eqpt.	53.4	3.9	6.8	8.4

[1]Inferred Capital Costs = Value added - Labour Compensation

= Selling value of shipments - materials costs - energy costs - labour compensation.

[2]Capitalization = Investment/employee = Inferred Capital Cost/Employee

[3]Capital Intensity is calculated as Inferred Capital Costs as a % of Value Added.

Source: Statistics Canada catalogues 31 203 and 61 007

It is important to point out that capital intensity and production processes vary widely across the textile industry, so that costs would be expected to show similar variation from plant to plant. With respect to the noise problem, for example, "There are noises common only to certain processes and equipment. Different types of machines require very specific remedies to control noise levels. As a result, ...applied research...is greatly limited to individual industries, to individual processes, and even to machine makes and models."[14]

Costs are also inversely related to plant size as shown in Table 9. This is almost certainly due to economies of scale in production and expenditure, and illustrates that a key factor in evaluating the cost-effectiveness of standards governing machinery maintenance is the degree to which advantage can be taken of these economies of scale. This is further evidence that costs can vary from firm to firm.

Table 9

Costs of Compliance with OSHA Standards by Company Size - U.S.

# of Employees	Estimated Total Expense	Estimated Per Worker Expense
	$	$
1 - 100	33 000	660
101 - 500	104 000	400
501 - 1 000	212 000	270
1 001 - 2 000	372 000	250
2 001 - 5 000	863 000	245
5 000	7 146 000	

Source: Ashford, N.A. Crisis in the Workplace. Cambridge, Mass.: MIT Press, 1976, p. 318. Based on National Association of Manufacturers Investigation.

STANDARD 8: NOISE CONTROL

Industrial noise is both pervasive and difficult to control.[15] It is present in most manufacturing settings and, as will be shown, it can also be very costly to mitigate.

The most thorough study available on the costs of noise reduction to industry was conducted by the consulting firm of Bolt, Beranek, and Newman, Incorporated (BB and N) at the request of the U.S. Department of Labor. It was commissioned in light of proposed legislation designed to reduce the allowable maximum exposure to noise over an eight-hour period from 90 dbA to 85 dbA. Most of the discussion in this section is based on their work.

There are at least 21 different methods of noise control that must be considered in each specific setting or industry. BB and N did their study with these complexities in mind and their results are based on the following assumptions:

(i) The costs shown "...do not contribute to capacity or productivity increases".

(ii) Three-year and five-year compliance periods were considered.

(iii) The cost of noise control devices will remain constant over the relevant period.

(iv) The costs include those of audiometric testing and monitoring.

(v) "The cost estimates for audiometric testing, noise monitoring, and hearing protection programs are based on actual costs incurred by firms that are presently performing these functions."

(vi) "The costs of...engineering controls are based on data obtained in conjunction with previous projects and in conjunction with visits to plants in a...sample group of firms."

(vii) "Noise control techniques and materials...are with few exceptions technically feasible and presently available."

The important results of their study for present discussion are:

(1) cost of noise monitoring - $12 per worker (total of $155 million)

(2) cost of audiometric testing - $20 per worker (4.3 million workers)

(3) capital cost of compliance - total - 90 dbA - $10.5 billion in chosen industries

(4) capital cost of compliance - total - 85 dbA - $18.5 billion in chosen industries

(5) the "...cost of maintaining, monitoring and replacing hearing protectors...is estimated to be approximately $10 per worker per year."

Costs by industry are presented in Table 10. Note that these are total costs and that they will vary inversely with the length of time given for compliance, ceteris paribus. In particular, the inflation factor is not considered here.

Table 10

Capital Costs of Compliance[1] with Noise Level Regulation

	(1) 85dbA	(2) 90dbA	(1)-(2)	1971 Sales (Millions)	1971 Profits (Millions)
	(Billions of 1975$)				
				$	$
Textiles	2.70	1.10	1.60	24 030	1 068
Food	1.68	0.59	1.10	103 631	5 141
Tobacco	0.09	0.04	0.05	5 528	1 217
Apparel	0.01	0.00	0.01	25 025	1 025
Lumber and Wood	0.65	0.16	0.49	14 931	927
Furniture/Fixtures	0.58	0.19	0.39	9 754	424
Paper	0.50	0.14	0.36	25 458	951
Printing/Publishing	1.00	0.87	0.13	26 887	1 996
Chemicals	1.40	1.10	0.30	51 873	6 735
Petroleum/Coal	0.26	0.21	0.50	26 935	6 825
Rubber/Plastics	0.50	0.30	0.20	17 044	1 208
Leather	0.01	0.00	0.01	5 218	317
Stone/Clay/Glass	0.52	0.29	0.23	18 535	1 483
Primary Metals	1.90	0.90	1.00	53 067	2 055
Fabricated Metals	1.60	1.30	0.30	42 026	2 103
Machinery	2.82	2.20	0.62	55 560	4 869
Electrical Mach.	0.39	0.18	0.21	49 168	4 705
Transport Equip.	1.08	0.67	0.41	86 920	6 893
Utilities	1.00	0.58	0.42	22 922	N.A.

[1]Based on a three-year compliance period.

Source: B, B, and N reports in Sound and Vibration (Sept. 1976) and Occupational Safety and Health Reporter (Feb. 1974)

Several points must be made. First, it is the capital costs of noise compliance which make up, by far, the largest share of the total. Secondly, one of the hardest hit industries is textiles - one of the more competitive yet vulnerable in North America. At a cost of $1 407 per production worker[16] (1975) to comply with the 90 dbA standard, the effect on domestic textile firms could be devastating. Improvements in productivity in the textile industry could be entirely negated by noise reduction legislation. This becomes evident when one notes that total capital and repair expenditure in the Canadian

textile industry was $2 530 per worker in 1976, so the cost of merely attaining noise levels of 90 dbA ($1 407 per worker) could theoretically increase capital costs in Canada by at least 56 per cent.

As a labour standard, a noise regulation would most likely have to be accompanied by a clause on the method of attainment. In particular, if the standard could be met through the use of personal protective devices (which, in some cases, it cannot) then that would have to be considered. In fact, as noted above, it has been argued in the U.S. courts that PPD's are the only realistic way to reduce noise exposure due to the extremely high cost of engineering controls.

STANDARD 9: COTTON DUST CONTROL

The last standard under consideration in this section is that of minimizing workers' exposure to cotton dust. This is just one manifestation of the pervasive problem of occupational diseases developing from contaminants and carcinogens in the air. Consideration of this standard is warranted as it is estimated that 46 per cent of the people employed in the textile industry (SIC22) are exposed to cotton dust.[17] Also, the standard in the U.S. was 1.0 milligram per cubic meter of air, but "...few mills, if any, were in compliance...as late as the early 1970's, and most are not presently in compliance".[18]

Establishing the cotton dust standard has been fraught with difficulty in the U.S. In the OSHA, the exposure level was set at 1.0 mg/m^3 of air over an eight-hour period. However, after union pressure and subsequent technical research, a standard of between 0.1 mg/m^3 and 0.2 mg/m^3 was recommended by the National Institute for Occupational

Safety and Health (NIOSH). Lack of agreement on an acceptable standard has, in fact, generated law suits in the U.S. Finally, a standard of 0.2 mg/m^3 was agreed upon, even though textile unions, in particular, demanded the 0.1 mg/m^3 level.

The definitive study of the costs of a cotton dust standard was done by the Research Triangle Institute (RTI) and entitled Technological Feasibility Assessment and Final Inflationary Impact Statement: Cotton Dust (1976). Their results provide the substance for the present discussion.

Tables 11 and 12 provide the central results of the RTI work. They are based on an evaluation of the technology required to meet the 0.5 mg/m^3, 0.2 mg/m^3, and 0.1 mg/m^3 standards. For example, the two former levels can be met with sophisticated filtration systems, but to meet the 0.1 mg/m^3 standard would "...require complete equipment enclosure of stringent fittings of both recirculated and makeup air in the ventilation system".[19] Note that the annual costs shown in the tables are calculated on the basis that the standard will be met by six equal expenditures over six years.

Table 11

Total Installed and Annualized Compliance Costs (millions$)

	Exposure Limit	Installed Cost	Annualized Capital Charges	Operating Costs	Energy Cost	Total Annualized Cost
		$	$	$	$	$
Yarn Production	0.5mg/m^3	211.8	33.8	6.9	20.6	61.5
	0.2	984.4	158.3	15.6	67.9	241.6
	0.1	2 802.7	450.6	23.3	147.0	620.6
Cotton Weaving	0.5	9.1	1.5	1.7	0.6	3.7
	0.2	1 387.9	233.1	40.7	86.3	350.1
	0.1	3 939.1	633.2	112.6	245.1	990.9
Total	0.5	255.1	40.8	16.1	25.5	82.5
(all textile	0.2	2 696.5	433.6	72.4	189.2	694.9
industry)	0.1	7 141.5	1 148.0	154.0	435.7	1 737.4

Source: Northrup, H. R. et al. The Impact of OSHA. Philadelphia, University of Pennsylvania, 1978, p. 516.

Table 12

Costs of Compliance - Selected Companies (millions$)

	# of Plants	Sales (Millions$)	0.5 mg/m^3 Exposure		0.2 mg/m^3 Exposure		0.1 mg/m^3 Exposure	
			Capital	Annual	Capital	Annual	Capital	Annual
		$						
Burlington	65	1 288.5	20.56	6.00	95.48	23.46	271.63	60.17
J.P. Stevens	39	834.1	12.12	3.54	56.28	13.83	160.13	35.46
Dan River	15	333.0	10.40	3.03	48.26	11.85	137.29	30.43
Textiles, Inc.	15	149.0	1.95	0.57	9.19	2.25	26.31	5.80
Fab Industries	4	64.8	0.09	0.03	0.47	0.11	1.39	0.30
Mount Vernon Mills	6	50.0	1.87	0.54	8.67	2.13	24.65	5.46
Crown Crafts	1	1.1	0.05	0.01	0.21	0.05	0.61	0.13

Source: Ibib., pp. 518-519.

These tables exhibit some particularly interesting facts. Not only do capital costs make up, by far, the largest percentage of total costs, but costs rise in an exponential fashion as the exposure limit is reduced. In the cotton weaving industry for example, it costs $9.1 million to attain the 0.5 mg/m^3 level, but $1 387.9 million to attain the 0.2 mg/m^3 level. Also, Table 12 suggests the possibility of a positive correlation between company size and costs of compliance. The variation in costs across companies is also very wide and increases as the exposure limit falls.

Using 1975 employment figures, these results can be translated into per employee costs. This is done in Table 13. It is interesting that ensuring a maximum level of cotton dust exposure of 0.1 mg/^{3} would cost $9 132 per production worker at least.[20]

Table 13

Exposure Limit	Installed Cost	Annual Cost
	$	$
0.5 mg/m	326.21	105.50/yr.
0.2	3 448.21	888.62/yr.
0.1	9 132.00	2 221.74/yr.

Source: Derived from data in Ibid.

Lest there be any doubt that attaining a 0.2 mg/m^3 is very expensive, consider the following. "If no price increases are assumed, the profits after taxes will be negative for all six textile sectors for both 0.2 and 0.1 mg/m^3 limits".[21] More reasonably, it is expected that there would be a 56 per cent increase in cotton weaving products. These are aside from the problems of financing and capital availability that may ensue.

OVERVIEW

The purpose of this section is threefold. It provides a summary of the foregoing analysis, explores further the significance of the estimates provided and discusses the problems encountered.

In Table 14, the cost estimates derived in the previous sections are presented. It is important to keep in mind the assumptions on which those calculations are based, but several useful pieces of information can still be extracted from the table. The most obvious point is that among OSH standards there can be a very wide range in costs. This is due primarily to variation in the demands for technological innovation necessitated by standards legislation and is essentially the basis for the distinction between basic and sophisticated standards made at the beginning of the paper.

It will also be observed that the variance in the estimated cost of certain standards can be large. This can be traced to a number of sources including the initial conditions at individual plants, the time taken to attain the standard and generally, market structure and the economies of individual firms.

Table 14

Summary of Cost Estimations - $CDN/Employee (1976)

	Low Estimate	Mean Estimate	High Estimate
	$	$	$
(1) 35-hour week		not applicable	
(2) Soft Technologies			
(a) Medical Skills	0.36	-	75.00*
(b) Medical equipment	0.80	2.00	4.00
(c) Education	-	16.00*	-
(d) Training (O-J-T)	-	25.00*	73.00*
(3) Personal protective devices	-	35.00	-
(4) Equipment maintenance	38.00*	50.00*	63.00*
(5) Noise control (90 dbA)	-	1 407.00	-
(6) Cotton dust control (0.2 mg/m^3)	-	3 448.00	5 332.00

*Annual expenditure.

A more important point should now be raised. In light of this wide cost variation, the correct choice of an effective set of standards for implementation becomes even more essential. This problem has been addressed by F.C. Rinefort (1977) who set out to define the most cost-effective set of labour standards. He found that "...guarding or the correction of unsafe physical conditions was frequently not cost-effective". It is not the case that these activities are undesirable as such, but that "...at current levels of spending, further reductions in work injury costs in the industries studied may best be achieved by further expenditures for the most cost-effective" activities. These are: safety rules, off-the-job safety, safety orientation and meetings, and medical facilities, supplies and staff. These correspond to the set of standards discussed in this paper as soft technologies.

For analytical purposes, it is necessary to assume that productivity is unaffected by expenditures for labour standards improvements. In reality, this is an oversimplification. As Duns's Review (January 1972) notes, "OSHA will encourage faster replacement of people by equipment and, of course, safer plants will have lower accident rates and more productive manpower". As a consequence of OSHA, productivity gains of up to 15 per cent have been predicted.

A central objective of this paper is to describe the procedures and key factors which are integral to a costing of various labour standards. To this point, it has been shown that the evaluation of these standards can be done in terms of an economic model to measure long-term impact or to distinguish between various forces acting on key economic variables, or in some cases, by an accounting procedure. Such a method typically involves identifying the basic component expenditures required by a standard and deriving a formula which sums the components. These formulae are especially useful when labour costs are the important factor. Labour costs vary greatly over time and across jurisdictions and so are not easily generalized. For this reason the words "not applicable" appear in Table 14.

Yet another perspective on labour standards costing remains to be investigated. It involves a study of labour standards within an international context, that is, a study of trade considerations. Canada is very much a trading nation, and her relatively high labour standards can have an effect on trade because of the resulting higher production costs. This will be illustrated when the textile industry is examined

as a case in point. Also, labour standards agreements, for example ILO conventions, can impact on trade patterns and domestic industry. The costing issues discussed in Part I can be given further meaning when contrasted with labour standards in other nations with which Canada trades. A preliminary look at these issues is found in Part II.

PART II - INTERNATIONAL LABOUR STANDARDS

The introduction of labour standards into trade models and other international discussion generally, raises a set of complex and difficult questions. Implementation and enforcement mechanisms and definitional problems must all be considered. In this section attention is focussed on the evaluation of economic costs of international labour standards. Specifically factors affecting cost analyses are examined and a theoretical model to estimate the domestic impact of an international labour standards package is then presented.

COSTING ISSUES

To measure the economic impact on Canada of international labour standards, the cost to our major trading partners must be determined. As the textile industry is the case study in this paper certain nations, primarily in southern and south-east Asia, are of interest. Countries in these regions provide strong competition for the domestic industry and labour standards will potentially have a significant effect on them.

The requisite data for an empirical analysis of this type is not often available. However the methodologies and cost estimates of Part I may be applied.

1. LABOUR COMPENSATION

The difference in pay for time worked between Canada and Asian nations is well known, but remarkable nevertheless. The Textile Workers Asian Regional Organization (TWARO) has gathered data which shows that in 1975 (the most recent year for which comparable data is available) the average hourly wage in their industry was 1/10 or less of that in Canada's textile mills (see Table 15). Even if adjustments are made for productivity differentials, wages per unit of output remain proportionately much higher in Canada than in these developing nations. The implication is that there is practically no value in using Canadian wage data to infer labour standards costs in other nations. Fortunately wage data is relatively complete for many countries, so direct compensation costs can be calculated directly as in Part I of this paper.

Table 15

Textile Industry - Rate of Pay in $U.S. (1975)

Nation	Rate of Pay
Canada[1]	4.56
Korea	0.45
Malaysia	0.21-0.29
India	0.20
Hong Kong	0.96-1.15
Taiwan	0.52-0.62

[1]Includes production workers only.

Source: TWARO reports and Statistics Canada No. 72-618.

Note: There are minor differences between countries in the definition of rate of pay, but these don't affect relative magnitudes.

The indirect compensation patterns are more complex. "Fringe benefits" are a much more important facet of the compensation package in Asian textile establishments than in their Canadian counterparts. Indeed, with the exceptions of sick leave, retirement allowances (pension and benefit plans) and the official hours of work (which are approximately 10 hours per week less in Canadian textile plants) employee benefits are not dissimilar. Evidence for this has been synthesized from TWARO and International Textile, Garment, and Leather Workers' Federation (ITGLWF) reports and is tabulated below. It should be noted that for all the countries appearing in Table 16, except Canada, the compensation levels were legal requirements unless otherwise indicated.

Table 16

Textile Industry - Indirect Compensation (circa 1975)

	Canada	Malaysia	Hong Kong	Taiwan	India
1. Paid Annual Leave	2-4 weeks	1-2 weeks	1 week	1-4 weeks	2 weeks
2. Official Hours of Work	36-40/week	48/week	48/week	48/week	48/week
3. Sick Leave (Annual max.)	15 weeks & 2/3 pay	14-18 days (60 days if hosp.)	1 day/month	30 days	52 days/yr.
4. Maternity Leave	12 weeks	8 weeks	10 weeks (w/o pay)	8 weeks	12 weeks
5. Statutory Holidays	10-11 days	8-13 days	10 days	16 days	10 days
6. Annual Bonuses	$195	15 days wages[2] to 7 weeks wages	1 mos.[2] wages	1-3 mos.[2] wages	8.33 to[2] 20% of profits/worker
7. Retirement Allowances	$229[1]	no data	$108/2 yrs.[2]	no data	no data

[1]Employer contributions to pension plans in textile industry, 1976 (average per employee).

[2]A summary of the actual experience of textile companies.

Source: TWARO and ITGLWF reports, Statistics Canada 72-618

The methodology described previously, at least for short-term costing, can be applied in an evaluation of standards of the type in Table 16. A researcher would most likely have difficulty in obtaining more complete data however. It is possible that compensation data from one developing nation could be employed as an approximation of that in another (in the same geographical region), but such an exercise would have to be done with sensitivity to local practices and its effectiveness would ultimately depend on the standard in question.

2. SAFETY AND HEALTH CAPITAL EXPENDITURES

Despite its obvious importance, relatively little is known about the capital costs which are attributable to labour standard regulations. This is likely to be a particularly acute problem in nations where data is not collected to the same degree as in Canada. However, there are two reasons to believe that Canadian, or more precisely, North American, data could be useful in this regard. First, the supply sources of capital equipment are relatively homogeneous. Indeed, some high technology equipment is produced by very few companies in a handful of countries. Second, international capital flows are prevalent, so that institutional barriers between markets would be less effective in supporting large supply price differentials.

The usefulness of Canadian data as an example in these circumstances is conditional. There can be a large variation in 'pre-standard' or initial conditions, so it is incremental and not total costs which should be emphasized. Also, a potential source of error are external factors peculiar to particular regions of countries. For example, the cotton dust problem does not exist in southern, humid climates because it does not circulate in the air and imposing a standard regulating cotton dust would be irrelevant.

The advantages of certain locations can become an important factor. For example, some textile manufacturers in the northern United States have reportedly transplanted their operations to the South rather than face federal health regulations. In these circumstances, the costs to the affected regions extend beyond direct expenditures to economic growth and trade issues.

The difficulties that appear to be associated with a standard by standard analysis of costs suggest that a more general approach to the problem may be useful. The following section examines the domestic impact of a selected international labour standards package.

A MODEL OF LABOUR STANDARDS IN TRADE

Generally, labour standards are higher in Canada than in her trading partners-particularly in the textile industry. It is an interesting exercise to evaluate what would happen if foreign labour standards were brought up to Canadian levels. Companies in countries with which Canada trades would be faced with additional expenditures and through the price mechanism, trade patterns would likely change. This notion forms the basis of the analysis to follow. The textile industry remains the focal point.

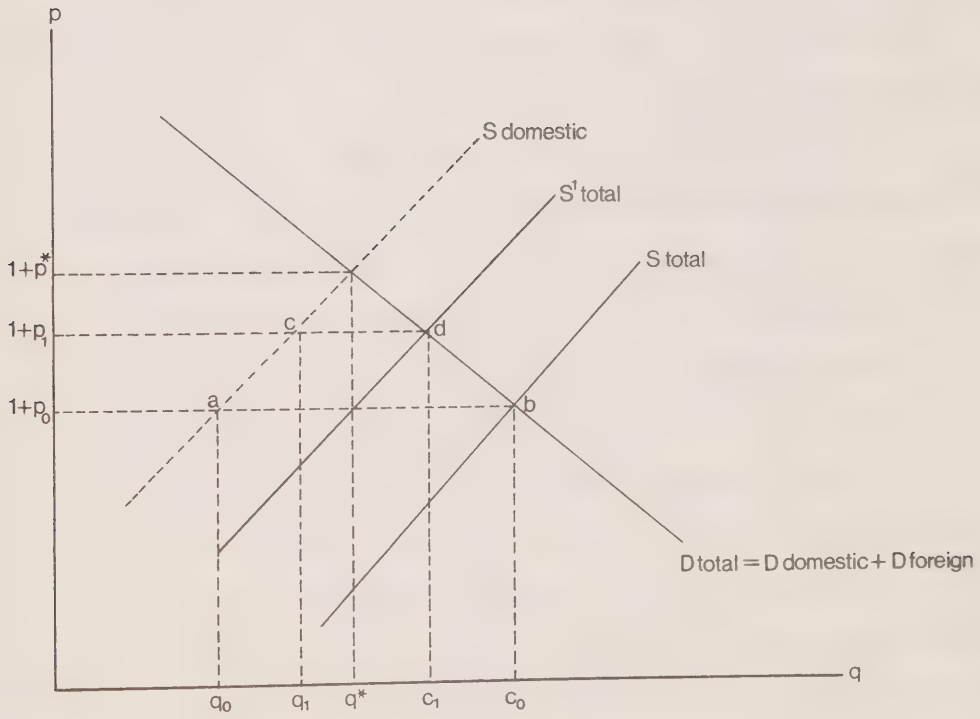
Canadian textile producers are relatively inactive in foreign markets (3.5 per cent of the total value of shipments was exported in 1977) and in recent years imports have exceeded exports by approximately 8 to 1. Therefore the study is focussed primarily on market forces in the domestic economy.

The central line of argument can be stated in terms of the standard Marshallian supply/demand model (See Fig. 1). The only major modification is that supply is separated into its domestic and foreign

sources, where foreign supplies (imports) are assumed to satisfy excess demand for domestic production at all relevant prices. The price (p) can be interpreted as a weighted composite of textile product prices in the Canadian market and it reflects market forces and institutional barriers such as tariffs.

Figure 1

Supply and Demand in the Canadian Domestic Textile Industry



Consider the following: initially at price (1+po) domestic production is (q_o) and imports, equal to ($\overline{ab}$), make up the total demand (Co). Following the adoption of improved labour standards, in the plants of suppliers in foreign countries, the price will rise to ($1+p_1$) reflecting increased costs. Total demand will fall to (C_1) domestic production will rise to (q_1), (approaching the equilibrium output of q*) and the difference ($\overline{cd}$) will be imported. In effect the price increase makes it profitable for domestic firms to increase production and their products, at the higher price, will replace some of the imported goods. In other words, the competition from foreign supplies is no longer as severe. It should be noted that there is a price (albeit very high) at which demand falls to the point where it is totally satisfied by domestic output.

Both (1+po) and ($1+p_1$) are artifically determined prices. In a closed economy the price would equilibrate to (1+p*) and in an open one, with no tariffs or trade barriers of any kind, they would fall below (1+po) reflecting the availability of low-cost imports.

The foregoing is an example of how international labour standards could impact on a domestic industry. It is now necessary to establish the magnitude of the initial costs of a potential labour standards package. This can be done within the framework of a sensitivity analysis. For example, a rough estimate of the percentage of total spending typically ascribed to labour standards in Canada (L) can be calculated according to (4), where (k) and (l) are factor

intensities of capital and labour respectively and (x) and (y) are percentages of capital and labour expenditures respectively, allocated to labour standards.

$$L = xk + yl \qquad (4)$$

For the textile industry in Canada, it is estimated that k = .41 and l = .59 (with significant variation across subsectors).

In the manufacturing sector generally, as illustrated in Table 3, indirect compensation totals about 20 per cent of wage costs (y = .2) and evidence suggests[22] that safety and health expenditures range from 3 to 10 per cent of total capital spending (x = .07). Thus L equals 14.67 per cent. Employers devote about 15 per cent or more, generally between 5 per cent and 20 per cent, of their total annual expenditure to items classified as labour standards. It could be assumed then, that textile manufacturers in developing countries faced with upgrading labour standards would have annual production cost increases of 5 to 20 per cent. This range is certainly debatable, but on the basis of the preceeding calculation, and the evidence of Part I, it appears at least realistic and instructive. Three discrete cost increments are examined in Table 17.

The analysis can be taken a step further. Assume the existing "rate of protection" or tariff on textiles entering Canada is 40 per cent (suggested in The Textile Industry - A Canadian Challenge, p. 48). Then the effect on imports can be estimated with the following formula:

$$\Delta M = \eta(\Delta P/1+p)\ Mo \qquad (5)$$

where Mo: initial level of imports (see $\overline{ab}$ in Fig. 1)

p : rate of protection (= .4)

η : price elasticity of demand for imports (= -2.09) for textiles[23] over the relevant price range.

M: change in imports (see $\overline{ab}$ - $\overline{cd}$ in Fig. 1)

In effect, this equation evaluates variation in imports given the changes in relative prices through the price elasticity of demand mechanism. Table 17 is derived from it.

Table 17

The Effect of Changes in Protection - Textiles, 1976

Change in effective protection (ΔP)	5%	10%	20%
A) Hong Kong			
Mo = $11 326 000			
ΔM ($million)	0.845	1.69	3.38
% change in total Cdn. imports	0.08	0.17	0.34
B) Korea			
Mo = $11 600 000			
ΔM ($million)	0.866	1.73	3.46
% change in total Cdn. imports	0.09	0.17	0.35
C) Taiwan			
Mo = $7 011 000			
ΔM ($million)	0.523	1.05	2.09
% change in total Cdn. imports	0.05	0.11	0.21
D) India			
Mo = $13 643 000			
ΔM ($million)	1.02	2.04	4.07
% change in total Cdn. imports	0.10	0.20	0.41
E) Third World			
Mo = $289 135 000			
ΔM ($million)	21.58	43.16	86.33
% change in total Cdn. imports	2.16	4.33	8.66

Table 17 illustrates, for example, that a 10 per cent increase in the rate of protection will reduce the value of textile imports from the third world by $43.16 million. This represents a 4.33 per cent fall in total textile imports. Three assumptions are implicit in this analysis: that world supply can meet world demand at all reasonable prices; that changes in prices are directly proportional to changes in costs; and that the effect on imports of a price change is not independent of the initial price level.

The step from the calculation of the change in imports to that of output and employment impact in the industry is technical and will ultimately depend on assumptions about market structure. It could be assumed that any fall in imports is exactly matched by an increase in domestic production, ($\Delta Y = -\Delta M$). This is unrealistic however as it is the same as assuming perfectly inelastic demand. In reality domestic production would not replace all the import cutbacks.

Nevertheless once correct demand elasticities are found which relate ΔM to ΔY, employment could be calculated from:

$$E = \rho \Delta Y \qquad (6)$$

where E = number of jobs created

ρ = job coefficient.

The coefficient ρ requires some explanation. It represents the number of jobs per unit of gross output value and has been calculated by the U.S. Department of Labour for a great many industries (see United States Bureau of Labor Statistics Bulletin 1831).[24] Calculations of ρ for Canadian industries have not been made.

It is not within the scope of this paper to present an empirical application of this procedure but it seems relatively straightforward and workable, given the necessary data. It could provide much needed technical support for statements about the economic impact of international labour standards on domestic industry.

CONCLUSIONS

This exploratory study has brought into focus several of the economic issues that arise from proposals to introduce selected labour standards. Its two main sections have attempted to clarify and evaluate labour standards, and examine their impact from domestic and international perspectives. Attention was also drawn to the methodological issues that must be faced in work of this nature. Finally, a means by which labour standards can be classified has been described.

There are two major obstacles to precise evaluation of labour standards: the lack of available data and the absence of a definition or listing of fair or minimum labour standards. To date, little work has been done in calculating the price(s) that OSH regulations carry. Companies rarely separate costs attributable to safety and health from general maintenance expenditures. Concerning the second problem, labour standards that have been identified by various organizations tend to be stated in terms that are too general for analytical work.

Notwithstanding these difficulties, useful points can be made. A set of labour standards which could be applied at low economic cost does exist. These would involve soft technologies and potentially, human rights issues. The very real possibility arises that labour standards can become assets to employers, improve employee morale, and increase productivity. There is also no inherent reason why analysis of the impact of labour standards cannot be more complete than at present. The discipline of economics provides adequate methodologies for this work.

The very wide range in the calculated costs of labour standards suggests that the choice of the correct set of standards for any given company may ultimately be the critical issue. Coupled with social and humanitarian considerations, governments or employers may ultimately have to face a task of economic optimization.

Another implication, the central one for policy, of this report is that there is not yet sufficient information on which to base a precise quantification of labour standards costs. Even the narrowly defined analysis in this paper required assumptions and the frequent use of estimated variables, and the degree to which the results depended on these assumptions was high.[25] Specifically, acceptance or rejection of an international labour standards plan cannot yet be confidently based on economic criteria.

Two rewarding paths for future research are now apparent. Work on methods to account for the implementation and maintenance costs of labour standards is needed, particularly in the area of occupational safety and health. These costs should also be made available for public discussion. Further refinement of a mechanism to describe the domestic impact of international labour standards agreements is also required.

Notes

1. A very useful summary of work on the unionization - wage rate relationship was prepared by C.J. Parsley, "Labour Union Effects on Wage Gains: A Survey of Recent Literature", Jour. of Econ. Lit., March 1980, pp. 1-31.

2. To illustrate assume that a low value for P is \$40 and the high is \$200 and that one first-aid unit must be available for every 100 employees. Then low and high cost estimates would be as follows:

$$C_1 = 40\ [(758x1)+(74x2)+(67x4)+(24x8)]/68209 = \$0.80$$

$$C_2 = 200\ [(758x1)+(74x2)+(67x4)+(24x8)]/68209 = \$4.00$$

3. Follman, J. The Economics of Industrial Health. p. 225.

4. Conference Board. "Industry Roles in Health Care", by S. Lusterman. New York, 1974.

5. Let n = 39 (68 200 man-hours to be taught by instructors who each offer 1 750 man-hours, annually), t = \$16 000, E = 68 209, w = \$4.50, r = .1, h = 10, and s = \$2 per worker.

6. The Impact of OSHA, p. 387. The OSH Act (OSHA) is a comprehensive set of standards for industry which was passed into law in the United States in 1971.

7. Assume a turnover rate of 10 per cent (r = .1), that h = 80 hours (2 weeks) and k =1.

8. Rinefort, F. C. A New Look at Occupational Safety and Health. p. 10.

9. The Impact of OSHA, p. 484.

10. Ibid., p. 492.

11. Ibid., p. 492.

12. Follman, p. 259.

13. For example, ((0.8) (53.4))/68209 = $62.63. This is another case in which American data must be used in lieu of Canadian.

14. The Impact of OSHA, p. 424.

15. Ibid., p. 10.

16. That is, $1.1 billion divided by 782 000 production workers (U.S. 1975).

17. That is, 411 000 in the U.S., of which 38 368 are believed to have byssinosis, a disease caused by cotton dust contamination of the lungs.

18. The Impact of OSHA, p. 497.

19. Ibid., p. 513.

20. Personal protective devices are not an alternative here as they are with noise control. As noted in Ibid. p.526, "dust level reduction with respirators is neither easy nor assured."

21. Ibid., p. 513.

22. See, for example, Follman, pp. 249-252, and Ashford, pp. 319-321.

23. Trade Negotiations in the Tokyo Round, p. 58.

24. Job Coefficients and Import Elasticities

Sector	η	ρ
Textiles	-2.09	0.0000544
Knitting Mills	-2.09	0.0000276
Clothing	-2.09	0.0000784
Leather	-2.07	0.0000550
Wood Products	-2.14	0.0000308
Furniture/Fixtures	-2.07	0.0001227

25. This is not a consequence of the degree of sophistication of this report. The detailed examination of noise control of a 90dbA standard done by BB and N made a $3 billion error in the calculation of costs to 19 industries. For the 85dbA standard the error was $13 billion. BB and N reported these errors in 1976 after a revision of their 1973 estimates. This illustrates the scope for improvement in the evaluation of the costs of OSH standards.

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